DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]Especially this invention relates to a means to really form this and to miniaturize, about an optical isolator.
[0002]
[Description of the Prior Art]in recent years, it will be necessary to process various kinds of information in large quantities and at high speed from text to picture information, and with the spread of multimedia, though shape is compact, compared with the conventional magnetic recording medium, a storage capacity is markedly alike, and the demand of large optical discs is expanded quickly.
[0003]Drawing 4 is a pattern perspective view showing the example of composition of the optical pickup device for optical discs which used the conventional optical isolator and this. The polarization beam splitter which the optical pickup shown in this figure has [polarization beam splitter] the polarization film surface 101a allocated in the predetermined angle to incident light, and makes only a predetermined polarization component penetrate. (It is hereafter described as PBS) The optical isolator 100 which comprises the 101, and lambda/4 wavelength plate 102, The collimate lens 110 which generates parallel light, the reflective mirror 120 made to reflect incident light in a predetermined angle, and OBUJUKU Tollens 130 for extracting incident light to one point are stationed with a prescribed interval.
[0004]The optical pickup device shown in this example operates as follows. First, if P polarization (horizontal polarized light) and the coherent light which has S polarization (vertical polarized light) ingredient enter into PBS101 from the laser diode (LD) which omitted the graphic display, while this will reflect S polarization component in the determined direction 141, It functions as prism which makes the direction of movement 142 penetrate P polarization component. lambda/4 wavelength plate is constituted using crystal etc. as everyone knows, and operates as a phase plate.
Since it has the operation which changes circular light or circular light into linear polarization for linear polarization, From lambda/4 wavelength plate, after the positive circularly polarized light (for example, right-handed-circularly-polarization light) 143

outputs and being formed in a parallel beam with the collimate lens 110, the light from which it was focused via the reflective mirror 120 and the object lens 130 is irradiated by the rugged surface (information storage side) 150a of the optical disc 150.

[0005]If this irradiation light reflects from the rugged surface 150a, since a direction of movement will be reversed, the hand of cut of circular light is reversed and it becomes a reverse circularly polarized light (left-handed-circularly-polarization light), and it enters into the lambda/4 wavelength plate 102 via the object lens 130, the reflective mirror 120, and the collimate lens 110. Here, since a reverse circularly polarized light is changed into the S polarization 144 (linear polarization), it is led to the wave detector (Detector) which was reflected in the determined direction 145 by the polarization film surface 101a of PBS101, and omitted the graphic display as mentioned above.
[0006]Since the optical pickup operates like above, in each waveguide, polarization of incident light and catoptric light An opposite direction, That is, when incidence is P polarization, at the time of S polarization or a positive circularly polarized light, it is constituted so that it may become a reverse circularly polarized light and may not interfere mutually, and reflection takes out the catoptric light which has the information on an optical disc as an electrical signal in a wave detector.
[0007]
[Problem(s) to be Solved by the Invention]However, there was a problem as shown below in the conventional optical isolator used with an optical pickup device etc. which were mentioned above. That is, the polarization beam splitter and lambda/4 wavelength plate which constitute an optical isolator were manufactured individually, and since these were arranged with a prescribed interval and an optical isolator was constituted, there was a problem to which shape becomes large. In the conventional optical isolator, since this is miniaturized, if a polarization beam splitter and lambda/4 wavelength plate are pasted up with adhesives and it is made an articulated structure, incident light will reflect with the adhesives concerned and the characteristics -- passing loss increases -- will deteriorate. This invention was made in order to solve the problem about the conventional optical isolator mentioned above, and an object of this invention is to provide the optical isolator which really formed the polarization beam splitter and lambda/4 wavelength plate, and was miniaturized.
[0008]
[Means for Solving the Problem]To achieve the above objects, the invention of an optical isolator concerning this invention according to claim 1, lambda/4 wavelength plate is carried out at the upper surface of the 1st dielectric substrate, lamination arrangement of the 2nd dielectric substrate is carried out one by one at the upper surface of ** lambda / 4 wavelength plate, a polarization beam splitter film is formed in said 1st dielectric substrate undersurface, and a reflection film was formed in a part of 2nd dielectric substrate upper surface for an antireflection film at the other portion. The invention of an optical isolator concerning this invention according to claim 2, lambda/4 wavelength plate is carried out at the upper surface of the 1st dielectric substrate, lamination arrangement of the 2nd dielectric substrate is carried out one by one at the upper surface of ** lambda / 4 wavelength plate, a change beam splitter film is formed in said 1st dielectric substrate undersurface, and a reflection film was formed in a part of 2nd dielectric substrate upper surface. As for the invention of an optical isolator concerning

this invention according to claim 3, lambda/4 wavelength plate was carried out at the upper surface of a birefringent plate, and it was made to carry out lamination arrangement of the dielectric substrate at the upper surface of ** lambda / 4 wavelength plate one by one. The invention of an optical isolator concerning this invention according to claim 4 formed an antireflection film in the upper surface of said dielectric substrate in the optical isolator according to claim 3. The invention of an optical isolator concerning this invention according to claim 5 used a lithium NAIO bait board as said birefringent plate in the optical isolator according to claim 3 or 4. The invention of an optical isolator concerning this invention according to claim 6 used glass as said dielectric substrate in the optical isolator according to claim 1 to 5.

[0009]

[Embodiment of the Invention]Hereafter, based on the illustrated example of an embodiment, this invention is explained in detail. Drawing 1 is a type section figure showing the 1st example in the case of using the optical isolator concerning this invention for an optical pickup device. The 1st glass plate (the 1st dielectric substrate) 11 with which the optical isolator shown in this example has the polarization beam splitter film 11a on the undersurface, The lambda/4 wavelength plate 12 and the 2nd glass plate (the 2nd dielectric substrate) 13 that predetermined looked like [the upper surface] comparatively the antireflection film (AR coat) 13a and the reflection film 13b, and formed them in it are laminated one by one, and it is constituted. Since the 1st and 2nd glass plates 11 and 13 are the support materials for only supporting lambda/4 wavelength plate, they may be replaced with other dielectric materials.

[0010]The optical isolator shown in this example operates as follows. Namely, if the coherent light 14a which has an ingredient of P polarization (horizontal polarized light) and S polarization (vertical polarized light) from the laser diode (LD) which omitted the graphic display enters into the polarization beam splitter film 11a at an angle of predetermined, This functions as prism which makes the direction of movement 14c penetrate P polarization component while reflecting S polarization component in the determined direction 14b. Since lambda/4 wavelength plate has the function for it to be constituted using crystal etc. as everyone knows, to operate as a phase plate, and to change circular light or circular light into linear polarization for linear polarization, From lambda/4 wavelength plate, 14 d of positive circularly polarized lights (for example, right-handed-circularly-polarization light) output, and it inputs into the collimate lens which omitted the graphic display via the 2nd glass plate 13 and the antireflection film 13a formed in the upper surface.

[0011]On the other hand, it reflects from the rugged surface of an optical disc, and the catoptric light 14e which returns from the collimate lens side turns into a reverse circularly polarized light (left-handed-circularly-polarization light), as conventional technology was described, and it enters into the lambda/4 wavelength plate 12 via the antireflection film 13a and the 2nd glass plate 13. Here, since a reverse circularly polarized light polarizes to 14 f of S polarization, it is reflected in 14 g of determined directions for the reason mentioned above in the polarization beam splitter film 11a via the 1st glass plate 11, and again, it will be changed into the reverse circularly polarized light 14h in the lambda/4 wavelength plate 12, and will enter into the reflection film 13b.

[0012]While the reverse circularly polarized light 14h is reflected further here and a polarization characteristic changes to the positive circularly polarized light 14i again,

Since it is changed into the P polarization 14j in the lambda/4 wavelength plate 12, the P polarization 14j is led to the wave detector which omitted the graphic display with the character of the polarization beam splitter film 11a to make only P polarization penetrate.
[0013]The optical isolator concerning this invention shown in the 1st example in short, By combining the character in which a polarization beam splitter film makes only P polarization component penetrate, and the character which becomes reverse ****** in the case of reflection of the light of circular light, It constitutes so that catoptric light (p-polarized light ingredient) may be taken out from the place which estranged only a predetermined distance from the laser diode (LD) as a light source. Therefore, since necessary catoptric light can be led to a wave detector also in the state where lambda/4 wavelength plate and the polarization beam splitter film were made to approach extremely, the miniaturization of an optical isolator is attained.
[0014]The antireflection film 13a is also called the AR coat, and is a thing of the common knowledge as art which reduces reflected [the CRT display surface]. In the optical isolator concerning this invention, this antireflection film 13a is installed for the purpose of oppressing reflection of incident light and reducing passing loss. Therefore, in the use which does not make an issue of passing loss, it is not necessary to have the antireflection film 13a. Drawing 2 is a type section figure showing the example (the 2nd example) of the optical isolator concerning this invention in the state where the antireflection film 13a was deleted.
[0015]Next, the 3rd example of the optical isolator concerning this invention is described. Drawing 3 is a type section figure showing the 3rd example of the optical isolator concerning this invention. The optical isolator shown in this example laminates the lithium NAIO bait 31 as a birefringent plate, the lambda/4 wavelength plate 32, and the glass plate (dielectric substrate) 33 that formed the antireflection film 33a in the upper surface one by one, and is constituted. The glass plate 33 may be replaced with other dielectric materials for the same reason as the 1st example mentioned above.
[0016]The optical isolator shown in this example operates as follows. Namely, if the coherent light 34a which has an ingredient of P polarization (horizontal polarized light) and S polarization (vertical polarized light) from the laser diode (LD) which omitted the graphic display enters into the lithium NAIO bait 31 at an angle of predetermined, While reflecting an s-polarized light ingredient in the determined direction 34b from the character of a birefringent plate, it functions as prism which makes the direction of movement 34c refract for it and penetrate a p-polarized light ingredient.Since lambda/4 wavelength plate has the function to change circular light or circular light into linear polarization for linear polarization as mentioned above, From lambda/4 wavelength plate, 34 d of positive circularly polarized lights (for example, right-handed-circularly-polarization light) output, and it inputs into the collimate lens which omitted the graphic display via the glass plate 33 and the antireflection film 33a formed in the upper surface.
[0017]On the other hand, it reflects from the rugged surface of an optical disc, and the catoptric light 34e which returns from the collimate lens side turns into a reverse circularly polarized light, as mentioned above, and it enters into the lambda/4 wavelength plate 32 via the antireflection film 33a and the glass plate 33. Here, after a reverse circularly polarized light is changed into 34 f of S polarization, it will enter into the lithium NAIO bait 31, but since it has the character to make only S polarization component penetrate, to the incidence from an opposite direction, as for a birefringent

plate, 34 g of S polarization components can be led to the wave detector which omitted the graphic display.

[0018]By using a birefringent plate as mentioned above, structure of the optical isolator concerning this invention can be made easier than the 1st example. It may be made to delete the antireflection film 33a in the use which does not make an issue of passing loss like the case of the 1st example.

[0019]

[Effect of the Invention]This invention is **** about higher efficacy, when realizing the optical isolator which can be miniaturized, since the 1st dielectric substrate in which the polarization beam splitter film was formed on the undersurface, lambda/4 wavelength plate, and the 2nd dielectric substrate that formed the reflection film in the upper surface are laminated one by one and constituted, as explained above. If a birefringent plate is used instead of the 1st dielectric substrate, the optical isolator which simplified structure is realizable.

[Translation done.]